Proposed Plan for the Monticello Mill Tailings Site, Operable U Surface and Ground Wat

Monticello, Utah – November 2003

Introduction

This Proposed Plan identifies the preferred remedial alternative and provides the rationale for selecting that alternative for Operable Unit III, surface water and ground water of the Monticello Mill Tailings Site near Monticello, Utah. The Proposed Plan also describes the remedial alternatives considered for use at this site. The U.S. Department of Energy (DOE), with concurrence from the U.S. Environmental Protection Agency and the Utah Department of Environmental Quality, has developed this plan that is being issued as part of the public participation requirements as defined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan.

Public input on the preferred alternative and other alternatives is an important part of the cleanup remedy selection process. On the basis of new information obtained during the public comment period, DOE may modify its preferred alternative or select another alternative. The public is encouraged to review and comment on the alternatives being considered for Operable Unit III. Additional information about the site and the remedial alternatives is presented in the Remedial Investigation Addendum/Focused Feasibility Study, which is part of the Administrative Record (see box on the next page).The final decision regarding the selected remedy will be determined only after consideration of all public comments made during the public comment period.

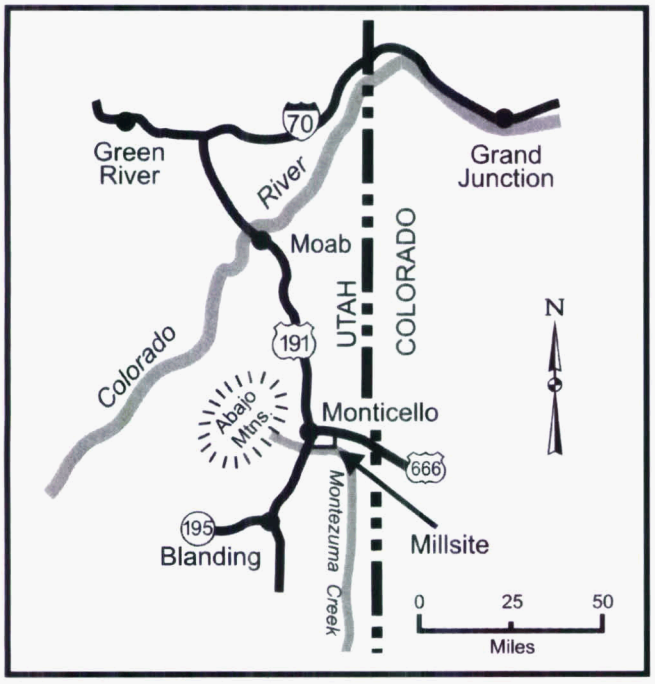

Figure 1. Site Location Map

Public Meeting

DOE will sponsor a public meeting to discuss the alternatives presented in this Proposed Plan. Oral and written comments will be accepted at the meeting.

Date: **Tuesday, December 9, 2003**

Time: **7:00 p.m.**

Place: **San Juan County Courthouse**
Monticello, Utah

Public Comment Period

Written public comments will be accepted on the Proposed Plan during a 45-day public comment period:

December 1, 2003, through January 15, 2004

A pre-addressed comment form is provided in this Proposed Plan.

Site Background and Characteristics

Operable Unit III is located in southeast Utah, in and near the City of Monticello (Figure 1). Operable Unit III encompasses contaminated surface water and ground water at and hydraulically downgradient of the former uranium and vanadium ore-processing millsite. The former millsite encompasses a 110-acre tract of land that is now owned by the City of Monticello. The Utah

Note: A glossary on page 14 of this Proposed Plan presents descriptions of terms used in this document.

Department of Transportation, the City of Monticello, and private citizens own the properties adjacent to the site. The former millsite is in an east-trending valley formed by Montezuma Creek, a small intermittent stream that flows from the Abajo Mountains located west of the millsite.

This millsite processed ores for the Federal Government from 1942 to 1959. Mill operations were terminated in 1960, leaving behind approximately 2.5 million cubic yards of mill tailings and contaminated soils. Mill tailings, the sandy by-products of uranium and vanadium ore milling, were stockpiled on the site. The tailings contain residual quantities of uranium, vanadium, and other trace metals, as well as remnant processing fluids. During and subsequent to plant operations, tailings were transported to downstream areas by water in Montezuma Creek, which flows through the millsite property. Tailings were also windblown onto surrounding properties or used for construction purposes on private properties in Monticello. In addition, radioactive and nonradioactive contaminants leached from the on-site tailings into the underlying shallow ground water system and have migrated beneath adjacent properties (Figure 2). The mill was dismantled in 1964. In the 1960s and 1970s, some of the tailings impoundments were graded, covered with clean or relatively clean soil, and vegetated.

Scope and Role

Because of concerns with the potential negative effects to human health and the environment from the contamination associated with the mill tailings, the Monticello Mill Tailings Site was placed on the National Priorities List in November 1989. DOE, the U.S. Environmental Protection Agency, and the Utah Department of Environmental Quality entered into a Federal Facilities Agreement and agreed to perform response actions at the Monticello Mill Tailings Site in accordance with the Federal Facilities Agreement. DOE is the lead agency that provides the principal staff and resources to plan and implement the response actions. The U.S. Environmental Protection Agency is the lead oversight agency with ultimate responsibility and authority but shares its decision-making activity with the Utah Department of Environmental Quality.

Besides Operable Unit III, the Monticello Mill Tailings Site includes two other operable units. Operable Unit I addresses contamination on the millsite, and Operable Unit II encompasses the peripheral properties, which are nearby properties that were contaminated mostly from windblown tailings. Following public comment, a Monticello Mill Tailings Site Record of Decision, which was signed by all Federal Facilities Agreement parties in September 1990, specified that contaminated materials from Operable Unit I and Operable Unit II would be placed in an on-site repository. A final remedy for Operable Unit III was not selected to provide time for additional remedial investigation activities focused on surface water and ground water.

In 1998, a Remedial Investigation was completed for Operable Unit III, and a draft Feasibility Study was prepared. No decision was made with regard to a final remedy for Operable Unit III; instead, an Interim Remedial Action was signed in September 1998 following a public meeting and public comment period. The Interim Remedial Action was done to allow project personnel additional time to observe the site during tailings removal and to study a new technology for ground water cleanup. In 2003, at the completion of the Interim Remedial Action, the Remedial Investigation was amended to reflect current information and the Feasibility Study, which focused on the remaining ground water concerns, was completed.

Construction of the repository started in 1995, and tailings removal was completed in September 1999. Cleanup of the millsite and nearby contaminated properties resulted in the placement of approximately 2.5 million cubic yards of contaminated material in the

For Additional Information

If you would like additional information on Operable Unit III of the Monticello Mill Tailings Site, the Remedial Investigation Addendum/ Focused Feasibility Study and other site-related documents are available for review at the following locations:

U.S. Department of Energy
Public Reading Room
2597 B¾ Road
Grand Junction, CO 81503
Telephone: (970) 248–6089

Monticello Repository Office
7031 South Highway 191
Monticello, UT 84535
(435) 587–2098

Supporting information is also available on the DOE Grand Junction office website

www.doe.gjo.gov

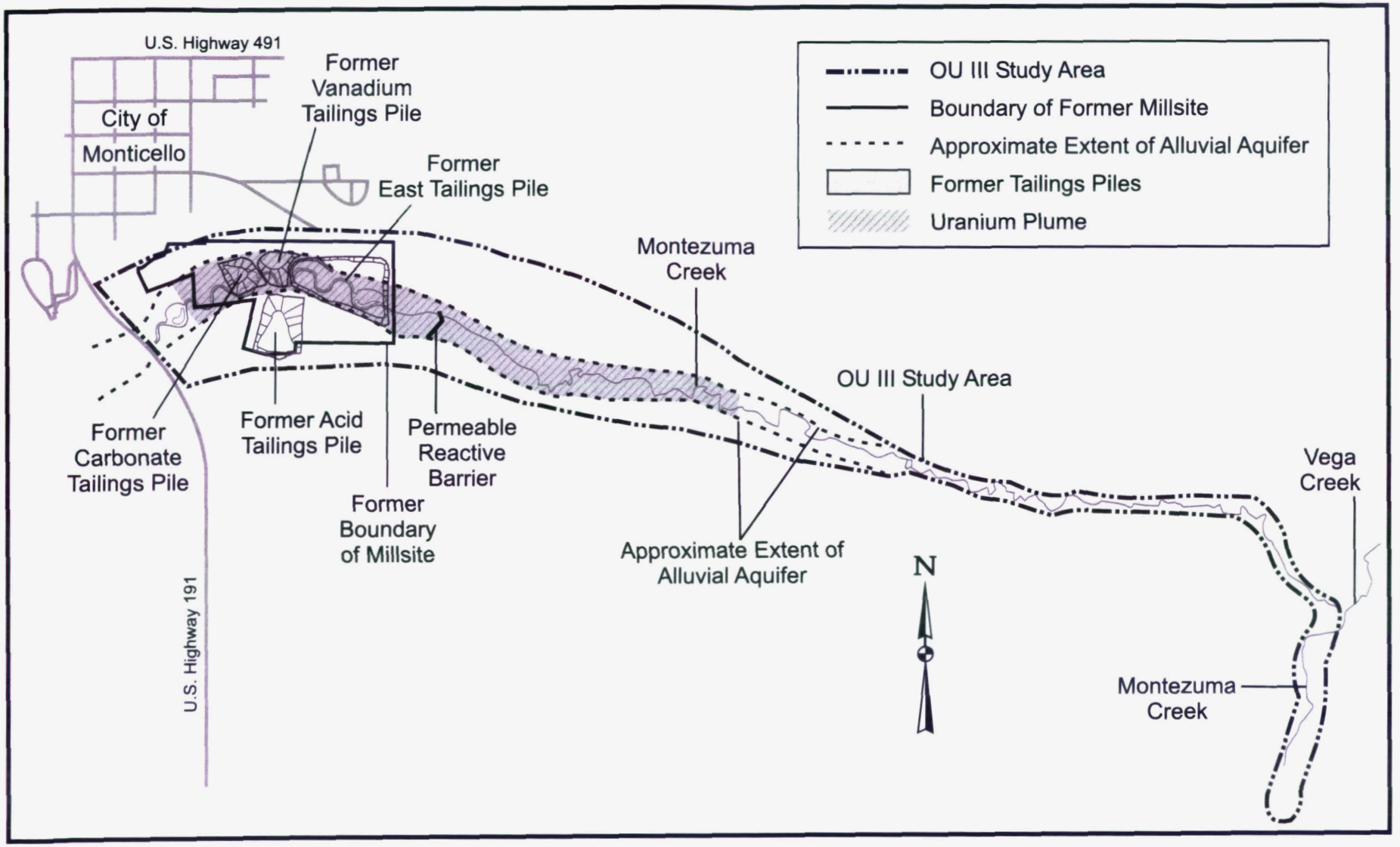

Figure 2. Pre-Remediation Locations of Tailings Piles and Current Uranium Plume at Monticello Mill Tailings Site

permanent on-site repository. Ownership of the millsite and several adjacent properties was transferred to the City of Monticello under the Federal Lands to Parks Program of the National Park Service. Most of the restoration activities needed to allow the former millsite to become a city park were completed in 2001.

Actions Taken To Reduce Risks at Operable Unit III

Numerous activities have been completed that reduce contamination and potential risks associated with Operable Unit III. Some of these activities were part of the Interim Remedial Action. Interim Remedial Action activities include millsite dewatering, institutional controls on ground water use, characterization of changed conditions on the millsite, surface water and ground water monitoring, and a permeable reactive barrier treatability study. Figure 3 presents a schematic of the permeable reactive barrier at Monticello.

The following descriptions provide a brief chronology of previous activities at Monticello:

1997 – 1999: ***Millsite Dewatering and Treatment*** As part of the millsite remediation, contaminants were permanently removed from the ground water system through treatment. Recovered water was treated at the wastewater treatment plant to State of Utah standards; some of the recovered water was also used for dust control. The Wastewater Treatment Plant treated or removed approximately 54 million gallons of water, and an additional 4.08 million gallons was used for dust control after the Wastewater Treatment Plant closed in May 1999.

Contaminants of Concern

Arsenic
Manganese
Molybdenum
Nitrate (as nitrogen)
Selenium
Uranium
Vanadium
Uranium-234/ Uranium-238
Gross alpha

1998: ***Remediation of Soil and Sediment Along Montezuma Creek*** DOE excavated contaminated soil and sediment to meet alternative action levels (cleanup criteria) along Montezuma Creek. The alternative action levels were based on gamma exposure rates and the likely activities that occur along each section of the creek. A total of approximately 20,900 cubic yards of contaminated material was removed, with nearly all of this material coming from the section of Montezuma Creek located between 0.5 mile and 1.5 miles downstream from the millsite.

1998 – Present: ***Institutional Controls*** Institutional controls have been applied at Operable Unit III to prevent the use of contaminated alluvial ground water and to restrict land use on nearby properties where soil contamination exists above the cleanup level used at the millsite. DOE has the responsibility to ensure the implementation of institutional controls through annual site inspections and CERCLA 5-year reviews.

1999: ***Additional Source Removal*** After excavating on-site soils to meet radiological cleanup criteria, an additional 75,000 cubic yards of material was removed from the millsite to minimize residual metal contamination that could contribute to ongoing ground water contamination.

1999 – Present: ***Permeable Reactive Barrier Treatability Study*** A permeable reactive barrier consists of specific reactive materials that are placed in the ground to remove contaminants chemically as ground water flows through the materials. A permeable reactive barrier was constructed east of the millsite as part of an interim remedial action under CERCLA. The treatment portion of this permeable reactive barrier is approximately 100 feet long and consists of zero-valent iron (scrap iron processed into small pieces). The permeable reactive barrier structure includes peripheral

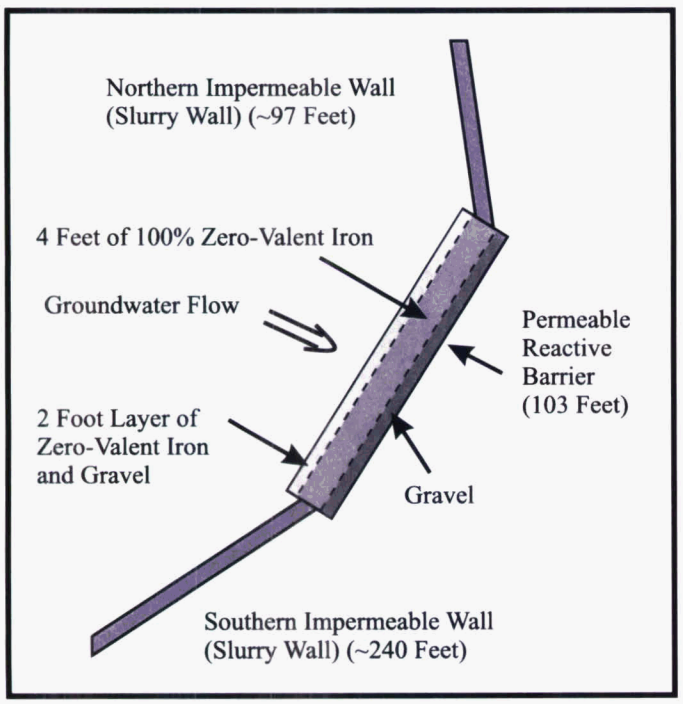

Figure 3. Schematic of Permeable Reactive Barrier Installed East of Former Millsite at Monticello, Utah

impermeable (slurry) walls that direct ground water flow to the reactive medium in the midsection of the barrier. Review of monitoring data from the treatability study indicates that the permeable reactive barrier has been effective in removing most of the contaminants from the ground water since its installation in June 1999. The permeable reactive barrier is currently treating contaminated ground water at an estimated rate of 6 to 9 gallons per minute. However, site data indicate that approximately 3 to 6 gallons per minute of ground water is bypassing the slurry walls.

Summary of Site Risks

The Remedial Investigation included an evaluation of the potential risks to human health and the environment (plants and animals) associated with the contaminants present at Operable Unit III. The Operable Unit III risk assessment identified

- Contaminants of concern (COCs): chemicals present at the site that may contribute to the majority of the risk (see box on page 4).
- Potential human and ecological receptors: who and what may be at risk.
- Exposure pathways: how the chemicals may reach human and ecological receptors.
- Potential health effects: how the receptors are affected if they come in contact with the contamination or contaminated media.

Human Health Risks

The human health risks were estimated based on the expected activities (for example, recreation) in the different areas east of the former millsite. On the basis of this information, the time individuals may be exposed to the contaminants at Operable Unit III was estimated and combined with contaminant toxicity information to determine risks to human health. Overall, the risk assessment determined that human health risks are acceptable under the current land uses of ranching and recreation. However, it was assumed that the open area east of the former millsite could be used for future residences and that the residents in this area may use the contaminated ground water as their primary source of drinking water. Under these conditions, risks to human health from contaminants that cause cancer are within the risk management range. Risks from contaminants that have negative effects other than cancer are unacceptable until attenuation of contamination in ground water occurs. DOE must maintain restrictions (institutional controls) on the use of this water until it is acceptable for use.

Ecological Risks

At this time, risks to ecological receptors from contaminated ground water and surface water are not significant enough to develop remedial alternatives to mitigate those risks. However, further study is planned to address selenium, which is a COC that has shown increasing levels in surface water and ground water since excavation of contaminated soil in the former millsite area was implemented.

Remedial Action Objectives

Remedial action objectives provide descriptions of the goals that a remedial action is expected to accomplish. Remedial action objectives identify risk or compliance levels for specific COCs. Remedial action objectives specified for protecting human health are expressed both in terms of contaminant concentrations and exposure pathways (the activity that causes a person to come into contact with the contamination at Operable Unit III) because protection can be achieved through a reduction in contaminant concentrations and a reduction or elimination of the exposure pathways. Remedial action objectives and acceptable levels of contamination (also known as preliminary remediation goals) were developed for ground water and surface water.

Ground Water Remedial Action Objectives

The following remedial action objectives were developed for the Operable Unit III alluvial ground water:

- Prevent ingestion of alluvial ground water that contains COCs that may cause cancer and poses a risk greater than 10^{-4} (1 in 10,000) or that has concentrations exceeding federal or state ground water standards.
- Prevent ingestion of alluvial ground water that contains COCs that may cause negative health effects other than cancer (noncarcinogens) with a hazard index or hazard quotient greater than 1.0 or that has concentrations exceeding federal or state ground water standards.

For Operable Unit III, acceptable risk-based levels of contamination are based on the potential future use of ground water and conservative assumptions on how

Operable Unit III Ground Water Preliminary Remediation Goals

Contaminant of Concern	Preliminary Remediation Goal[a]	Preliminary Remediation Goal Reference or Basis
Arsenic	10 μg/L	Safe Drinking Water Act
Manganese	880 μg/L	Risk based
Molybdenum	100 μg/L	Uranium Mill Tailings Radiation Control Act
Nitrate (as nitrogen)	10 mg/L	Safe Drinking Water Act
Selenium	50 μg/L	Safe Drinking Water Act
Uranium	30 μg/L	Safe Drinking Water Act
Vanadium	330 μg/L	Risk based
Uranium-234/ Uranium-238	30 pCi/L	Uranium Mill Tailings Radiation Control Act
Gross alpha	15 pCi/L	Safe Drinking Water Act

[a]μg/L = micrograms per liter of water.
mg/L = milligrams per liter of water.
pCi/L = picocuries per liter of water.

people would be exposed to the contaminants in ground water (for example, the volume of contaminated water ingested each year). These remedial action objectives will be achieved when COC concentrations in ground water meet preliminary remediation goals (see box above left).

Surface Water Remedial Action Objectives

Contamination associated with Operable Unit III surface water does not cause unacceptable risks to human health. Therefore, remedial action objectives were not based on risks to humans. Risks to ecological receptors are generally acceptable, with the possible exception of exposure to selenium. Risks from selenium to ecological receptors will be evaluated further and remedial action objectives were not based on these potential risks. Concentrations of COCs in some surface water samples taken from some locations on the former millsite exceed State of Utah surface water standards. Because concentrations of some COCs exceed state standards, the remedial action objectives for Operable Unit III surface water is to achieve compliance with state surface water standards for COCs in Montezuma Creek (see box above right for specific preliminary remediation goals).

Operable Unit III Surface Water Preliminary Remediation Goals Adopted From Utah Surface Water Standards

Contaminant of Concern	Preliminary Remediation Goal[a]
Arsenic	10 μg/L
Nitrate (as nitrogen)	4 mg/L
Selenium	5 μg/L
Gross alpha	15 pCi/L

[a]μg/L = micrograms per liter of water.
mg/L = milligrams per liter of water.
pCi/L = picocuries per liter of water.

Summary of the Alternatives

A primary objective of the feasibility study is to screen a wide range of possible cleanup alternatives and then to more completely evaluate the most promising alternatives. The Focused Feasibility Study for Operable Unit III evaluated the following alternatives in detail:

- Alternative 1: No Further Action With Institutional Controls
- Alternative 2: Monitored Natural Attenuation With Institutional Controls
- Alternative 3: Permeable Reactive Barrier With Institutional Controls and Monitored Natural Attenuation
- Alternative 4 (Option 1): Enhanced Permeable Reactive Barrier With Institutional Controls and Monitored Natural Attenuation (pump-and-treat enhancement)
- Alternative 4 (Option 2): Enhanced Permeable Reactive Barrier With Institutional Controls and Monitored Natural Attenuation (in situ enhancement)

Common Elements

All the alternatives include institutional controls, CERCLA 5-year reviews, and decommissioning of the permeable reactive barrier as common elements. All the alternatives, with the exception of Alternative 1, include monitored natural attenuation and Contingency Plans. Descriptions of these common elements follow.

Monticello Mill Tailings Site
Proposed Plan for Operable Unit III, Surface and Ground Water

Your input on the Proposed Plan for Operable Unit III, Surface and Ground Water, at the Monticello Mill Tailings Site is important to the U.S. Department of Energy. Comments provided by the public are valuable in helping us select the remedial alternative for Operable Unit III. You may use the space below to write your comments.

To submit your comments, you may detach this page, fold, fasten, attach postage, and mail to address preprinted on the other side or submit comments on any paper to the address provided. Comments will also be accepted by email.

Comments must be postmarked or received by email by January 15, 2004, to be considered in the final decision. If you have questions about the comment period, please contact Art Kleinrath at (970) 248–6037. Thank you for your input.

Name _____

Address _____

City, State, and Zip _____

Phone _____

Information Contacts

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For Additional Information

If you would like additional information on Operable Unit III of the Monticello Mill Tailings Site, the Remedial Investigation Addendum/ Focused Feasibility Study and other site-related documents are available for review at the following locations:

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Monticello Proposed Plan Comments
Mr. Art Kleinrath
U.S. Department of Energy
2597 B¾ Road
Grand Junction, CO 81503

- **Institutional controls**: This is the continued enforcement of existing institutional controls that prevent the use of the shallow alluvial ground water system and restrict land use. The conditions at Operable Unit III will be monitored on a regular basis as part of DOE's Long-Term Surveillance and Maintenance Program to verify that ground water is not used for domestic purposes. The institutional control restricting the development of wells into the shallow alluvial aquifer will remain in place until remediation goals have been attained; restrictive easements on land use should remain in place in perpetuity.

- **CERCLA 5-year reviews:** CERCLA mandates that all sites be reviewed at least every 5 years to ensure that the remedy is still effective and protective of human health and the environment. Modifications of the remedy may be necessary to ensure protectiveness.

- **Decommission the permeable reactive barrier:** The permeable reactive barrier, which was installed in 1999, is currently treating contaminated ground water. However, the permeable reactive barrier will become less effective over time because of a reduction in reactivity and a restriction of flow through the permeable reactive barrier. This barrier is useful but not essential to meeting remediation goals within 50 years. Therefore, when the permeable reactive barrier no longer removes COCs in the ground water to acceptable levels or if there is excessive mounding upgradient of the permeable reactive barrier, the permeable reactive barrier will be removed and disposed of in an off-site repository.

- **Monitored natural attenuation**: If there is no continuing source of contamination, contaminant concentrations in the ground water will naturally decrease over time through the influx of clean water and ground water movement. Monitored natural attenuation refers to the tracking of the natural reduction of contaminant concentrations through regular analyses of ground water samples.

- **Contingency Plan:** U.S. Environmental Protection Agency guidance recommends that contingency plans should be flexible enough to allow for incorporation of new information about site risks and technologies. The Contingency Plan for Alternatives 2 through 4 includes the possibility of replacing, rejuvenating, or relocating the permeable reactive barrier. The need for and appropriate contingency action will be determined jointly by DOE, the U.S. Environmental Protection Agency, and the Utah Department of Environmental Quality.

Alternative 1: No Further Action With Institutional Controls

Estimated Capital Costs (decommission the permeable reactive barrier): $32,112

Estimated Annual Costs (years 1–40): $37,080 (Year 1 starts October 2004)

Estimated Net Present Value: $526,000

Estimated Construction Time Frame: Less than 1 year to decommission the permeable reactive barrier

Estimated Time To Achieve Remedial Action Objectives: 42 years starting in October 2002

This no further action alternative includes the decommissioning of the permeable reactive barrier that was installed in 1999. It would also have considerably less water-quality monitoring, mostly because the need to monitor the permeable reactive barrier would be eliminated. The institutional control restricting the development of wells into the shallow alluvial aquifer will be in place until preliminary remediation goals are obtained.

Alternative 2: Monitored Natural Attenuation With Institutional Controls

Estimated Capital Costs (decommission the permeable reactive barrier): $32,112

Estimated Annual Costs (years 1–10): $123,580 (Year 1 starts October 2004)

Estimated Annual Costs (years 11–40): $113,980

Estimated Net Present Value: $1,474,000

Estimated Construction Time Frame: Less than 1 year to decommission the permeable reactive barrier

Estimated Time To Achieve Remedial Action Objectives: 42 years starting in October 2002

This alternative allows the permeable reactive barrier to remain operational as long as it continues to treat contaminated ground water effectively. It also includes comprehensive monitoring to evaluate the effectiveness of monitored natural attenuation and the permeable reactive barrier. The institutional control restricting the development of wells into the shallow alluvial aquifer will remain in place until the preliminary remediation goals are reached.

Alternative 3: Permeable Reactive Barrier With Institutional Controls and Monitored Natural Attenuation

Estimated Capital Costs (decommission the permeable reactive barrier): $32,112

Estimated Annual Costs (years 1–10): $123,580 (Year 1 starts October 2004)

Estimated Annual Costs (years 11–38): $113,980

Estimated Net Present Value: $1,460,000

Estimated Construction Time Frame: Less than 1 year to decommission the permeable reactive barrier

Estimated Time To Achieve Remedial Action Objectives: 40 years starting in October 2002

This alternative is similar to Alternative 2 except this alternative explicitly depends on the permeable reactive barrier to treat COCs effectively in the ground water entering the permeable reactive barrier and for the treated water exiting the permeable reactive barrier to enhance the effectiveness of monitored natural attenuation. Because this alternative takes credit for the permeable reactive barrier, the estimated time required to achieve remedial action objectives is 2 years shorter than Alternative 2, and the net present value costs are slightly lower because the monitoring costs associated with the shorter time frame are reduced.

Alternative 4 (Option 1): Enhanced Permeable Reactive Barrier With Institutional Controls and Monitored Natural Attenuation (pump-and-treat enhancement)

Estimated Capital Costs: $60,264

Estimated Annual Costs (years 1–10): $128,380 (Year 1 starts October 2004)

Estimated Annual Costs (years 11–37): $118,780

Estimated Net Present Value: $1,513,000

Estimated Construction Time Frame: Less than 1 year to plan and install the enhancement

Estimated Time To Achieve Remedial Action Objectives: 39 years starting in October 2002

Some contaminated ground water is currently bypassing the permeable reactive barrier along the south slurry wall. This alternative takes credit for the permeable reactive barrier as described in Alternative 3 with the addition of active enhancements to reduce the flow of contaminated ground water around the permeable reactive barrier. Option 1 involves extracting the bypass flow and treating it in the permeable reactive barrier. Water would be extracted from the bypass zone using about three extraction wells and would be piped to the treatment portion of the permeable reactive barrier. This alternative also includes the installation of a limited number of small-diameter observation wells to monitor the performance of the permeable reactive barrier enhancement. There is greater uncertainty on the effectiveness of the enhancement than the behavior of the permeable reactive barrier as presently constructed.

Alternative 4 (Option 2): Enhanced Permeable Reactive Barrier With Institutional Controls and Monitored Natural Attenuation (in situ enhancement)

Estimated Capital Costs: $124,988

Estimated Annual Costs (years 1–10): $123,580 (Year 1 starts October 2004)

Estimated Annual Costs (years 11–36): $113,980

Estimated Net Present Value: $1,536,000

Estimated Construction Time Frame: Less than 1 year to plan and install the enhancement

Estimated Time To Achieve Remedial Action Objectives: 38 years starting in October 2002

Alternative 4 (Option 2) is identical to Alternative 4 (Option 1) except in the approach used to treat the contaminated ground water that is bypassing the permeable reactive barrier. Option 2 consists of constructing an array of 10 to 20 large-diameter boreholes that extend to bedrock in the bypass zone. Each borehole would be backfilled with approximately a 10-foot column of the treatment material used in the permeable reactive barrier (zero-valent iron or a zero-valent iron and gravel mix). There is greater uncertainty on the effectiveness of the enhancement than the behavior of the permeable reactive barrier as presently constructed.

Evaluation of Alternatives

CERCLA requires that remediation alternatives be evaluated using the following nine criteria (also see Table 1):

Threshold Criteria

These criteria must be met for the alternative to be considered.

Table 1. Summary Evaluation of the Operable Unit III Alternatives

Evaluation Criteria	Alternative 1	Alternative 2	Alternative 3	Alternative 4 Options 1 and 2
Overall protection of human health and the environment	●	●	●	●
Compliance with applicable or relevant and appropriate requirements (ARARs)	◇	●	●	●
Long-term effectiveness and permanence	●	●	●	●
Reduction of toxicity, mobility, and volume through treatment[a]	○	●	●	●
Short-term effectiveness[b]	●	●	●	●
Implementability	○	●	●	○
Cost: net present value	$526,000	$1,474,000	$1,460,000	$1,513,000 (Option 1) $1,536,000 (Option 2)
State acceptance	The Utah Department of Environmental Quality currently accepts Alternative 2, but final acceptance is contingent on public comment.			
Community acceptance	Community acceptance of the preferred alternative will be evaluated after the public comment period.			
Notes	ARAR waivers would be required for compliance	Does not require specific performance of the permeable reactive barrier	Requires specific performance of the permeable reactive barrier	Requires landowner approval and effective performance of the permeable reactive barrier

[a]Alternative 4 is incrementally better than Alternative 3 which is incrementally better than Alternative 2 because there is a reduction in toxicity, mobility, and volume as more ground water is treated by the permeable reactive barrier.

[b]If the institutional control preventing use of the contaminated alluvial aquifer as a primary drinking water source fails, then Alternative 4 will have the greatest short-term effectiveness because it has the shortest time frame to meet remedial action objectives.

● = Fully meets criterion ○ = Partially meets criterion ◇ = Does not meet criterion

Overall protection of human health and the environment determines if an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

Compliance with applicable or relevant and appropriate requirements (ARARs) evaluates if the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site.

Balancing Criteria

Long-term effectiveness and permanence considers the ability of an alternative to maintain protection of human health and the environment over time and the reliability of such protection.

Reduction of contaminant toxicity, mobility, or volume through treatment evaluates an alternative's use of treatment to reduce the harmful effects of the COCs, their ability to move in the environment, and the amount of contamination present.

Short-term effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, nearby residents, and the environment during implementation.

Implementability considers the technical and administrative feasibility of implementing the alternative, such as the availability of equipment and skilled personnel or site access.

Cost includes estimated capital costs (such as the cost of treatment equipment); annual operating, maintenance, inspection, or monitoring costs; and net present

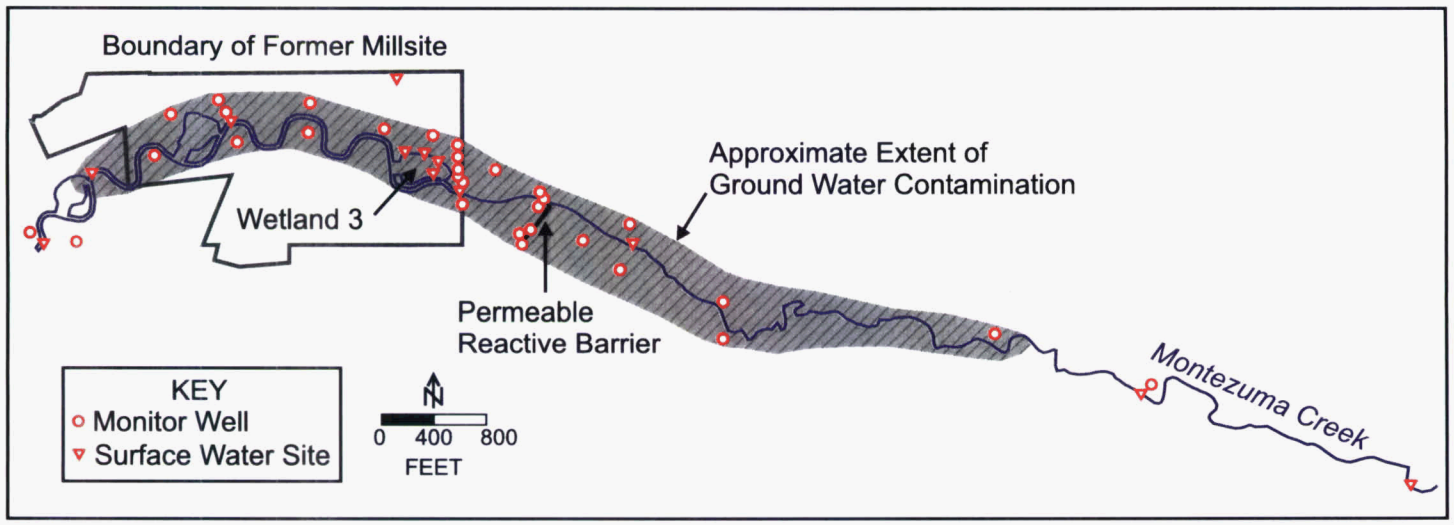

Figure 4. Proposed Initial Monitoring Network

value costs (total cost of an alternative over time in today's dollars).

Modifying Criteria

State acceptance considers whether the State of Utah agrees with DOE's recommendations presented in the Remedial Investigation Addendum/Focused Feasibility Study and this Proposed Plan.

Community acceptance of the preferred alternative will be evaluated after the public comment period and will be described in the Record of Decision. The Record of Decision will include a responsiveness summary that presents all the public comments and DOE's response to each comment. The preferred alternative can change in response to public comments or new information.

Table 1 on page 11 presents a summary evaluation of the alternatives.

Preferred Alternative

DOE believes that Alternative 2 provides the best balance of tradeoffs among the alternatives with respect to the CERCLA evaluation criteria. Alternative 1 may not meet all the evaluation criteria, and Alternative 4 has the highest cost and may be difficult to implement. Alternatives 2 and 3 are quite similar (they both meet the first six CERCLA evaluation criteria) except Alternative 2 does not rely on the performance of the permeable reactive barrier for cleanup of the contaminated ground water. Alternative 2 meets the remedial action objectives without taking credit for the successful performance of an innovative technology (the permeable reactive barrier). DOE selected Alternative 2 over Alternative 3 because the reduction in uncertainty of not depending on the permeable reactive barrier to perform as expected is worth the slightly longer cleanup period needed to meet preliminary remediation goals and the small increase in net present value of the two alternatives (less than 1 percent of total net present value). The U.S. Environmental Protection Agency and the Utah Department of Environmental Quality concur with DOE on the selection of Alternative 2.

The preferred remedy includes comprehensive long-term ground water and surface water monitoring that will be conducted to

- Verify that the contaminant plume is not expanding.
- Verify that contaminant concentrations decrease at acceptable rates.
- Detect changes in site conditions that may affect natural attenuation processes, such as changing flow direction between the alluvial and bedrock aquifers.

With the preferred remedy, water quality monitoring for COCs will be conducted twice each year. Figure 4 presents the proposed, initial monitoring network. The number of locations to be sampled will be seasonally adjusted. In the fall, comprehensive monitoring will be conducted by collecting samples from about 30 wells completed in the alluvial aquifer, 3 wells completed in the deeper bedrock aquifer, and 5 wells at the permeable reactive barrier. Surface water will be monitored at about 8 locations on Montezuma Creek and at 7 seep or wetland locations, including 2 locations in Wetland 3 and 3 seepage locations on the former millsite. Except for water-level and stream-flow measurements, the monitoring network is mostly a subset of the network currently in use (1 or 2 new wells may be installed). Sampling sites were eliminated where significant near-term changes in concentrations are not expected,

where past results vary widely between samples, where wells are not located close to the areas of greatest contamination or have poor yields, or where data are redundant.

Monitoring will focus on demonstrated reliable observation wells located in the contaminant plume and in areas where the most change is anticipated. Alluvial aquifer and deeper bedrock aquifer wells outside the eastern extent of the plume will also be monitored to verify that there is no further advancement of the contaminant plume. Periodic reviews will ensure that monitoring data are relevant, are of acceptable quality, and are collected at the appropriate locations for accurate tracking of the contaminant plume. The monitoring procedures will be revised on the basis of the periodic reviews.

Water-quality data from the same monitoring period each year will be analyzed to identify concentration trends with respect to time at groups of wells and to compare the trends to the expected cleanup time. Concentrations in samples collected in Wetland 3 will be compared to the assumed concentrations for the wetland in the Operable Unit III ground water model. The need for contingency action will be evaluated if

- Unexpected concentration increases or plume expansion are reported in the analytical data.
- Concentrations are decreasing slower than is required to achieve remedial action objectives within the time frame acceptable to the U.S. Environmental Protection Agency and the Utah Department of Environmental Quality (less than 50 years).

Aquifer cleanup will generally progress from west to east with the natural flow of ground water; cleanup of the aquifer is expected to be completed in the area upstream (west) of the permeable reactive barrier by about 2015. Therefore, trend analysis will focus only on this area for the first 10 years, although trends in wells downstream of the permeable reactive barrier will also be monitored. Cleanup progress will be assessed collectively for the area rather than by individual wells because the required level of precision for the latter is not possible. Focusing on the area of change minimizes the "masking" and "clutter" that can occur in data. Anomalous results because of sampling variability or other short-term perturbations will be resolved through subsequent samplings and investigations before initiating a contingency response. After the first 10 years, trend analysis will focus on water quality downstream of the permeable reactive barrier until remediation is completed.

As part of the restoration of the former millsite, wetlands were designed and created to attract wildlife, including waterfowl. DOE wants to ensure that selenium, a naturally occurring metalloid in the Monticello area, does not accumulate in wetland sediments to concentrations that would harm waterfowl. To evaluate if selenium is accumulating in concentrations that may affect the health of waterfowl, DOE will collect and analyze surface water samples.

DOE will also collect sediment samples at the three wetlands on the millsite and at a remediated sediment pond downstream of the millsite. The sediment samples will be collected and analyzed annually until the next CERCLA 5-year review in 2007. If selenium concentrations in representative sediment samples exceed 2 milligrams per kilogram and surface water samples exceed 5 micrograms per liter, DOE will consider collecting biota samples (such as macroinvertebrates). The possible need to sample biota will be discussed with the U.S. Environmental Protection Agency, the Utah Department of Environmental Quality, and the U.S. Fish and Wildlife Service as the monitoring data become available. Included in the CERCLA 5-year review will be an evaluation of the sampling data to understand the potential for selenium accumulation and an assessment of the protectiveness of this remedy to the environment.

DOE and the U.S. Environmental Protection Agency will also pursue funding for additional work at the permeable reactive barrier. This work would be conducted separately and in addition to the selected remedy for Operable Unit III. It is likely that the focus of this work will be on enhancement of the permeable reactive barrier to capture additional flow in the alluvial system.

The Next Step

DOE will consider all public comments received during the public comment period (December 1, 2003, to January 15, 2004) before selecting a final cleanup remedy for Operable Unit III; the preferred alternative may change based on input from the public or new information. All comments will be part of the responsiveness summary in the Record of Decision, which is the document that will outline the Operable Unit III cleanup plan. Members of the Federal Facilities Agreement for the Monticello Mill Tailings Site (DOE, U.S. Environmental Protection Agency, and Utah Department of Environmental Quality) will cooperatively make the final decision for Operable Unit III. It is anticipated that the Record of Decision will be signed by April 2004.

Glossary

Alternative action levels: The contaminants of concern concentrations in soil, water, or air that are protective based on the site-specific risk assessment. Alternative action levels are used as cleanup criteria during remediation rather than those normally specified in federal and/or state regulations.

Cancer risk: Presents the added probability of an individual or population developing cancer during a lifetime as a result of exposure to site contaminants.

Contaminants of concern (COCs): Site-related contaminants, which are identified during the site investigations and risk assessment, that may cause potential risks because of their toxicities and potential routes of exposure to human health and the environment.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. The acts created a special tax that goes into a Trust Fund, commonly known as the Superfund Program, to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Ground water: Underground water that fills spaces between soil particles and openings in rocks.

Institutional controls: Controls placed on property to restrict assess, use, or future development.

Interim remedial action: A term used under CERCLA to describe actions that partially cleanup or stabilize a site and are typically followed by other actions designed to provide long-term protection of human health and the environment. They are often short-term or temporary steps to prevent further spread of contamination or to achieve significant risk reduction quickly.

Hazard index: The sum of more than one hazard quotient for multiple substances or multiple pathways. As a rule, the greater the hazard index is above 1, the greater the level of concern.

Hazard quotient: The ratio of the exposure level of a single substance to a noncarcinogenic toxicity value.

National Oil and Hazardous Substances Pollution Contingency Plan: The federal regulation that guides the Superfund Program.

National Priorities List: The U.S. Environmental Protection Agency's published list of the highest priority hazardous waste sites in the United States for investigation and cleanup under CERCLA.

Net present value: The amount of money necessary to secure the promise of a future payment or a series of payments (annual costs) at an assumed interest rate.

Noncarcinogens: Compounds that may cause negative health effects other than cancer.

Operable unit: A discrete portion of a larger overall cleanup project.

Permeable reactive barrier: An innovative technology consisting of an engineered zone of reactive material placed underground that removes contamination in ground water flowing through it.

Plume: A body of contaminated ground water flowing from a specific source.

Record of Decision: A required report that documents the chosen remedy for a site. The report certifies that the remedy selection process was conducted in accordance with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan and provides the public with a document that consolidates information about the site and the chosen remedy.